

**INHALATION THERAPY IN OBSTRUCTIVE
AIRWAYS DISEASE: EVALUATION AND
INSTRUCTION OF METERED DOSE INHALER
TECHNIQUE**

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Introduction

The value of inhaled drugs has been recognised for millenia by ancient civilizations (Miller, 1973). Inhalation therapy has many advantages including drug delivery direct to site of action, rapid onset of therapeutic effect (Plit et al, 1972) minimisation of dose required (Newman & Clarke, 1985) minimisation of systemic side-effects (Sterling, 1978), avoidance of first pass metabolism (C & D Livingstone, 1988) and non-invasive delivery technique. However, specific drug delivery may be hindered by defence mechanisms of the respiratory tract (Reiser & Warner, 1986), and other problems may also be present since drug delivery depends on the mechanism of deposition (Newman, 1984), particle size (Rees et al, 1982), inhalation mode (Pavia et al, 1977) and patient factors. The types of drugs used in inhalation therapy include the beta adrenergic stimulants, anticholinergic bronchodilators, methylxanthines, sodium cromoglycate, corticosteroids, water and saline aerosols, mucolytics and antibiotics. The delivery systems employed are the nebuliser, dry powder inhalers and the metered dose inhalers (MDIs). Recently, a new device has been developed, and this is the Turbohaler^R.

Correct patient technique in inhaler use is critical for the success of therapy. Although correct MDI use involves a relatively simple procedure, studies have shown that patients often administer aerosol drug incorrectly. Patterson and Crompton [1976] found that 14% of patients had an 'inefficient' technique. In contrast, Orehek et al [1976] reported that 75% of inhaler users failed to administer them correctly. Other reports have placed the number of patients misusing their inhalers between these two extremes (Earis & Bernstein [1978]; Epstein et al [1979]; Gayrard & Orehek [1983]; Shim & Williams [1980]; Augusti et al [1985]; Saunders [1985]). Since the pharmacist is often the last link prior to the patient using the devices, he has an obligation to the patient to ensure that the medicine is administered correctly.

The objectives of this study were to:

- a) Assess the technique of local inhaler users, determine the major problems and correlate the results with those of other countries
- b) Examine the most effective method of instruction
- c) Determine the importance of reinstruction

- d) Evaluate the hypothesis that poor inhaler technique may be perpetuated by clinical staff

Method

Study 1: Inhaler technique assessment

An expansion of the correct inhaler technique recommended by Newman and Clarke [1984] was developed and used throughout the study. In this study, the ability of 141 patients to use their MDI was assessed by applying a scoring system to each step of the technique.

Table 1: Correct MDI technique and scoring system used

Step	Max Score
1. Ensure that the canister is firmly inserted in the case and is not below room temperature	5
2. Remove the cap, shake well and hold upright	15
3. Breathe out in a relaxed fashion	10
4. Hold head upright and tongue relaxed	10
5. Place the mouthpiece in mouth and close lips tightly around it	15
6. Breathe in deeply and while doing so, press metal canister firmly into the adapter	20
7. Release the pressure on the metal canister, remove the mouthpiece from the mouth and hold breath for 10 seconds	15
8. Breathe out slowly through the nose	10

Due to the subjective nature of this assessment, two precautions were observed:

- a) Each patient was assessed by two investigators, each one being unaware of the other investigator's scores
- b) Each step of the technique had a score range which indicated the patient's exact performance

Each patient was then asked to answer a short questionnaire which supplied information regarding demographic data, the disease and its severity, treatment and compliance, patient characteristics related to MDI use and patients' attitudes and beliefs. In addition, spirometry was performed on patients aged 0 - 11 years and a mental status questionnaire was compiled for patients over 60 years old.

Study 2: Phase 1: Instruction methods

a) Volunteer study

A pilot study was performed amongst 36 volunteers who had no previous experience in the use of MDIs. These were randomly assigned to one of 3 groups:

- i) Group A (written instruction): each volunteer was given a manufacturer's written instruction package insert (Ventolin^R Inhaler, M500050 1188)
- ii) Group B (personal instruction): each volunteer was instructed personally with a correct inhaler technique demonstration and instruction sheet
- iii) Group C (video instruction): a video presentation on the correct use of MDIs was prepared "in-house" and shown to the volunteers

The volunteers of each group were then given a placebo to practice with and their technique was then assessed. This study was performed to obtain a baseline reference for instruction methods.

b) Patient study

The 141 patients were divided into similar 3 groups and the instruction was given and assessment performed as in the volunteer study.

Study 2: Phase 2: Reassessment after 4 weeks

The patients had their technique reassessed in the same way as it was initially assessed.

All the above data was subjected to statistical analysis.

Study 3: Inhaler technique and the clinical staff

The advice on inhaler technique given unawares by a number of health care professionals and pharmacy technicians was recorded. The investigator presented himself as a recently diagnosed asthmatic patient who had been prescribed an MDI for the first time and was asking for advice. This survey was carried out to determine whether clinical staff were responsible for the fact that poor technique is still so widespread. A questionnaire was also issued to investigate the degree of familiarity of physicians and pharmacists with aerosol therapy.

Results:

Table 1: Distribution of patients in the study

Instruction Group (%)	Males (%)	Females (%)	Age Range in years (%)			
			0-11	12-18	19-59	>60
Manufactu- rer's sheet	17.7	12.8	3.5	12.1	8.5	6.4
Personal	29.8	18.4	13.5	14.9	12.8	7.1
Video	14.2	7.1	4.3	7.1	7.8	2.1

Table 2: Summary of results obtained from the patient questionnaire regarding MDI use

Average duration of MDI use: 5.74 years
Daily use: 61.7%
Previous instruction given: 81.6%
Instruction given by physician: 85.8%
Additional instruction received: 29.1%
Satisfied with technique prior to instruction: 78%
Physical and mental problems with MDI use: 4.3%
Appreciate educational material: 97.9%
Written form: 8.0%
Personal form: 76.15
Audio-visual form: 20.3%

Table 3: Mean scores for the 3 different instruction groups on the 3 assessment days

Instruction Group	Initial Assessment % Score		Assessment after Instruction % Score		Assessment 4 Weeks after Instruction % Score	
	Mal	N.Ire	Mal	N.Ire	Mal	N.Ire
Manufacturer's sheet	55.51	NRIS	66.24	61.87	64.16	59.13
Personal	59.21	NRIS	77.25	80.25	72.79	74.38
Video	58.52	NRIS	77.50	75.00	73.63	62.50

NRIS - Not Recorded In Study

Mal - Malta

N.Ire - N. Ireland (McElnav et al. 1989)

Figure 1: Evaluation of individual steps in patient inhaler technique

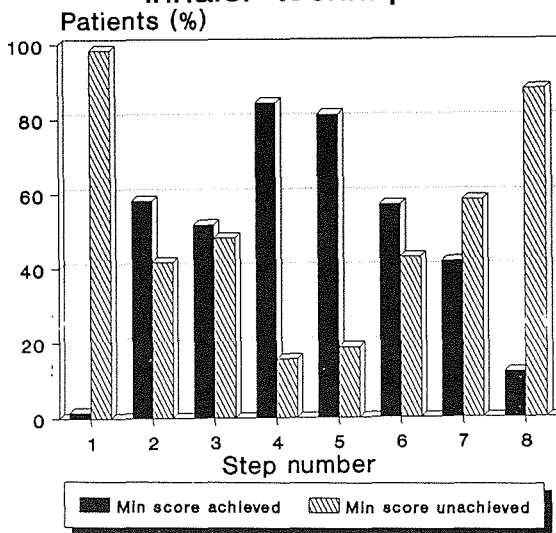
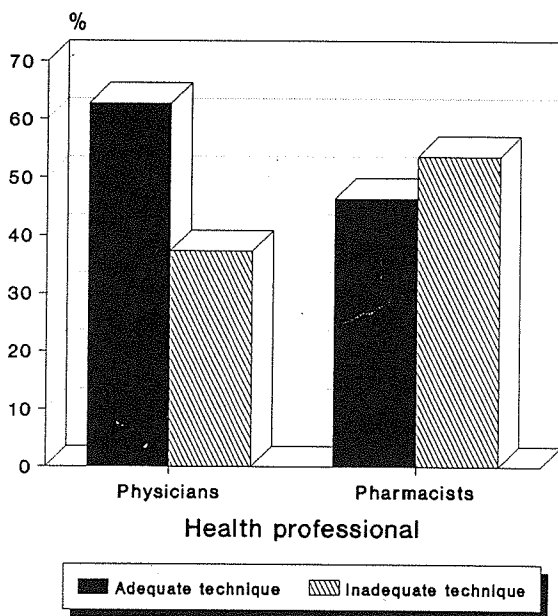


Figure 2: Inhaler technique
in part of the clinical staff



Discussion

Although it is now widely accepted that drug administration by inhalation is preferable to oral therapy, 33.33% of the patients in this study failed to have an adequate inhaler technique. The average inhaler technique was quite low (57.93 points), a score close to the lower boundary of the satisfactory range. Incorrect use diminishes the therapeutic effect and such a phenomenon was more common in the two extreme age groups, i.e., 0 - 11 years and > 60 years. The only compliance problem in the latter group was that of language (from Mental Status Questionnaire); this indicates poor hand-lung coordination and lack of proper instruction (only 36.17% had been given reinstruction prior to this study) as the major factors contributing to poor MDI technique.

The pilot volunteer study indicated personal demonstration and counselling, and video as efficient instruction methods. Such results were

reflected in the patient study: patient instruction by the use of a manufacturer's package insert was not enough and is in no way an alternative to personal or video instruction. Score improvements in the latter two groups were approximately equal and double that in the written instruction group. However, although video was found to be as effective as personal tuition, 76.1% of the patients preferred educational material in the personal form, with only 20.3% preferring the video. This should be further investigated since it indicates that video is as effective and less time-consuming than personal instruction, but is not as accepted by the patients.

The importance of reinstruction was demonstrated by the decrease in technique score observed in patients of all three instruction groups after four weeks. The lowest decrease was in the written instruction group, but this was only a reflection of the poor initial scores. The results obtained locally correlated well with those of McElnay et al (1989), except for the video assessment score recorded 4 weeks after instruction, where the total technique score decrease was much lower in this study than that reported by McElnay (4.99% compared to 16.67%).

The results obtained in the study concerned with health professionals support the hypothesis that poor inhaler technique may be perpetuated by clinical staff and that the latter are partly responsible for the fact that poor MDI technique is still so widespread. 37.5% of the physicians, 53.5% of the pharmacists and 66.7% of the pharmacy technicians failed to have an adequate MDI technique, but although highly significant they are not as alarming as those recorded in other countries. A paradoxical result was also observed in that although 80.14% of the patients believed that the pharmacist could provide such education, 32.62% of the patients had negligible confidence in their pharmacist.

Conclusion

The following conclusions can be drawn from the results that were obtained:

- a) 33.33% inadequate MDI users reflect the need of proper instruction and education
- b) Video instruction is as effective but less time-consuming than personal instruction and should therefore be employed in dispensary and out-patient waiting-rooms

- c) Technique deterioration with time did not differ between patients given a written instruction sheet to take home and those that were not given one, thus indicating the relative ineffectiveness of such an educational method in this case
- d) The average pharmacist should be more competent and motivated in order to increase patient compliance in inhalation therapy

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